

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
 Organization
 International Bureau



(43) International Publication Date
 29 January 2004 (29.01.2004)

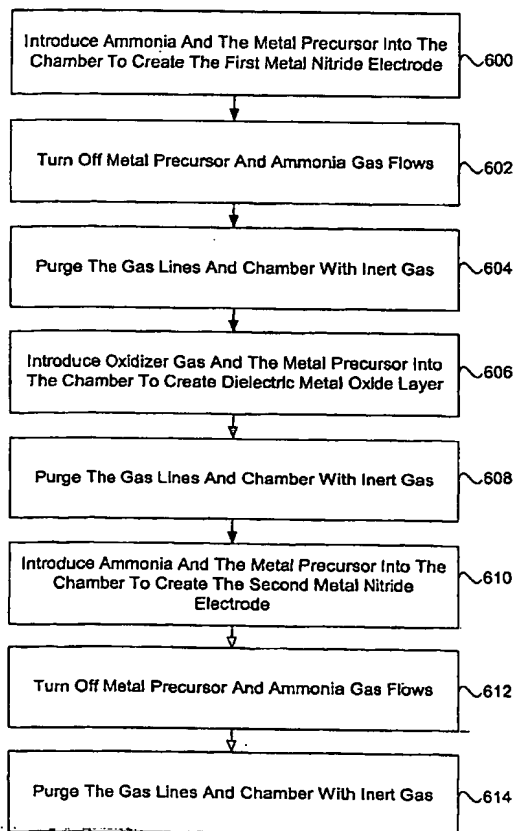
PCT

(10) International Publication Number
 WO 2004/010471 A2

- (51) International Patent Classification⁷: H01L (74) Agents: SWIATEK, Maria, S. et al.; Dorsey & Whitney LLP, Suite 3400, 4 Embarcadero Center, San Francisco, CA 94111 (US).
- (21) International Application Number: PCT/US2003/022385
- (22) International Filing Date: 18 July 2003 (18.07.2003) (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 60/396,734 19 July 2002 (19.07.2002) US (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant (for all designated States except US): ASML US, INC. [US/US]; 440 Kings Village Road, Scotts Valley, CA 95066 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): YOSHIHIDE, Senzaki [US/US]; 400 Clubhouse Drive, Aptos, CA 95003-4822 (US).

[Continued on next page]

(54) Title: IN-SITU FORMATION OF METAL INSULATOR METAL CAPACITORS CROSS REFERENCE TO RELATED APPLICATIONS



(57) Abstract: The invention describes an in-situ method of fabricating a metal insulator metal (MIM) capacitor and products formed by the same. The method utilizes atomic layer deposition (ALD) or metal-organic chemical vapor deposition (MOCVD). In the method, a metal precursor is sequentially reacted with a nitrogen source, oxidant, and then a nitrogen source again. Reaction with the nitrogen source generates the outermost conductive metal nitride (MN) layers (121). Reaction with the oxidant generates an inner dielectric metal oxide (MO_x) layer (110). Alternatively, or in addition, the metal precursor can be reacted with a mixture of oxidant and nitrogen source to generate inner dielectric layer(s) (231, 232, 310) of metal oxynitride (MO_xN_y). Because the same metal is used throughout the capacitor, the layers in the MIM capacitor exhibits excellent compatibility and stability.

WO 2004/010471 A2



Declaration under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designation US*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

- *without international search report and to be republished upon receipt of that report*